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Figure 3. End of copper tubing that was soldered to the brass valve shown in Figure 1.

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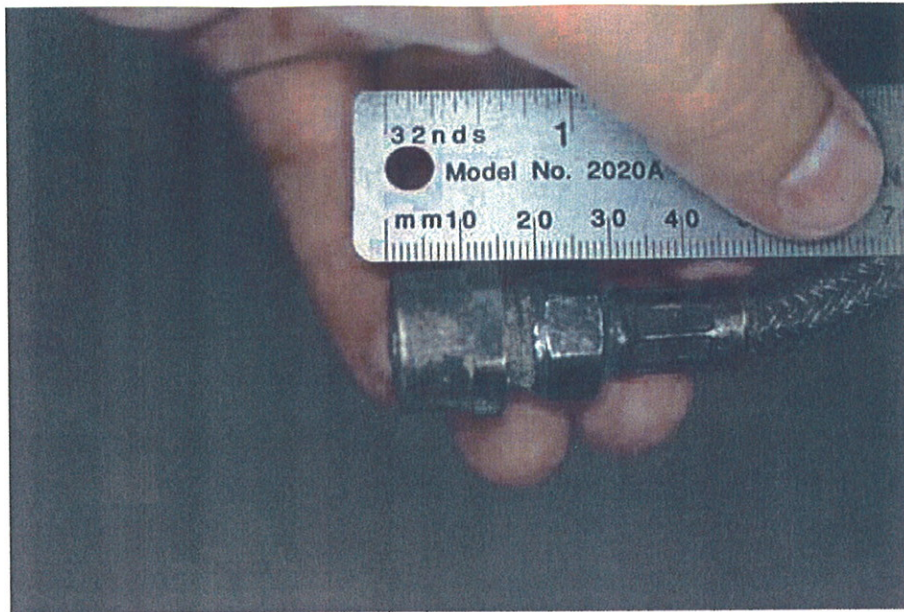


Figure 4. Photograph of the brass fitting that was soldered onto the exposed copper tubing in Figure 1.

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Analysis and Results

The four separated pipe joint sections that were examined in this investigation are shown in Figure 5 through Figure 8. Each separated joint was inspected by stereomicroscopy techniques, followed by scanning electron microscopy (SEM) and finally metallography and optical microscopy. The protocol that was followed for preparing and inspecting each of these joints was:

1. Stereomicroscopy of as-received joint;
2. First cut using a water-cooled band saw, as shown in Figure 5 through Figure 8;
3. Perform SEM analysis on the OD (Outer Diameter) of the removed joint;
4. Second cut using a water-cooled band saw, as shown in Figure 5 through Figure 8;
5. SEM analysis on the ID (Inner Diameter) of the removed joint;
6. Metallographic preparation of one half of each joint: mount in epoxy molding compound and polish through 0.25 μm polishing media;
7. Optical microscopy on the polished specimens;
8. SEM on selected polished specimens;

The preparation and analysis was performed at laboratories of Massachusetts Materials Research on January 16, 17 and 18 of 2006. It should also be noted that all samples analyzed by SEM on January 17 and 18 were rinsed with de-ionized water to remove any water-soluble contamination from the surface.

The results obtained from these analyses are presented in detail in the following sections of this report.

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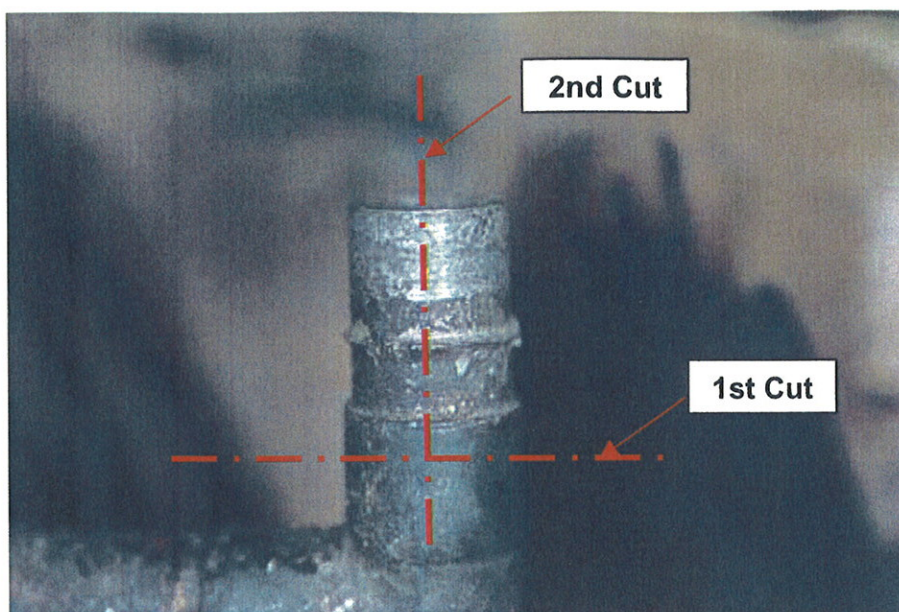


Figure 5. Male joint component that mated to the female joint shown in Figure 6. The red lines indicate where the joint was cut for analysis. This joint section is referred to as "Joint Section 1" in this report.

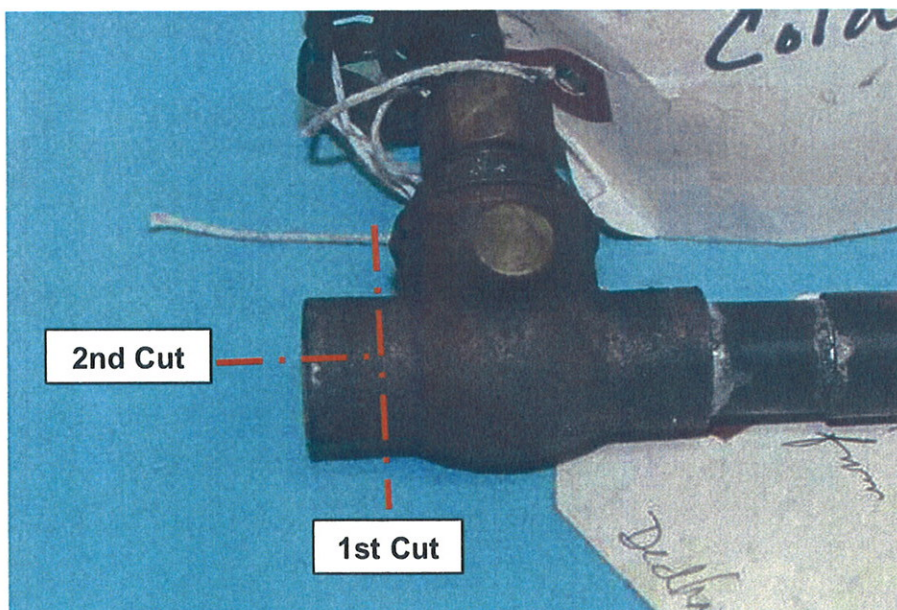


Figure 6. Female joint component that mated to the male joint shown in Figure 5. The red lines indicate where the joint was cut for analysis. This joint section is referred to as "Joint Section 2" in this report.

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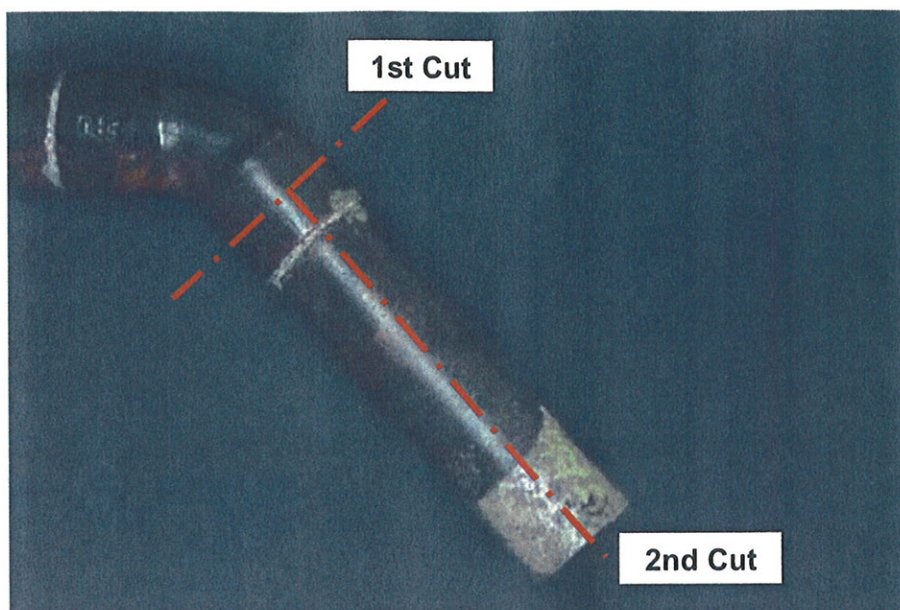


Figure 7. Male joint component that mated to the female joint shown in Figure 8. The red lines indicate where the joint was cut for analysis. This joint section is referred to as "Joint Section 3" in this report.

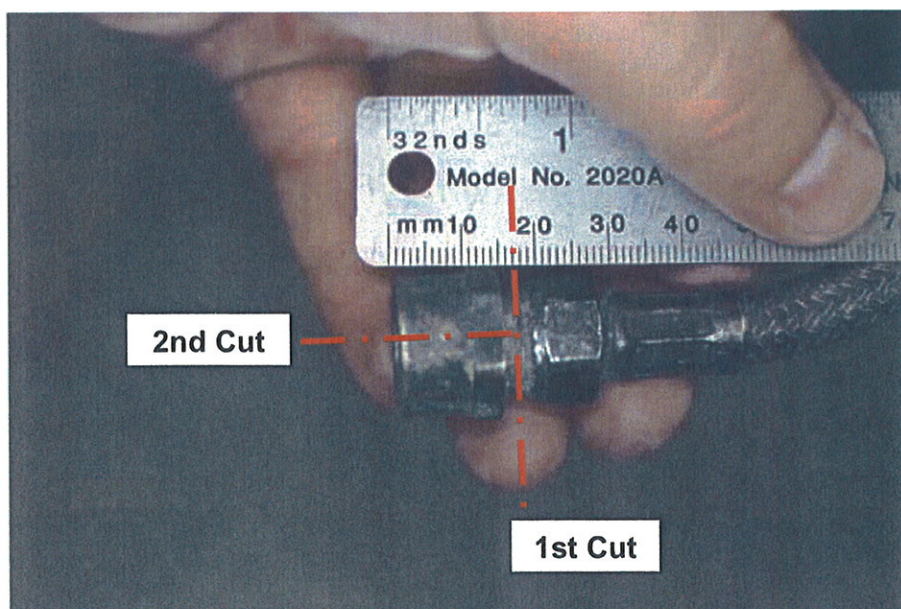


Figure 8. Female joint component that mated to the male joint shown in Figure 7. The red lines indicate where the joint was cut for analysis. This joint section is referred to as "Joint Section 4" in this report.